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APPLICATION NUMBER: *60/545,106*
FILING DATE: *February 17, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US04/34233*

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15585 60/545106 U.S.PTO 021704

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Mani	Ayyakannu	Troy, MI

☐ *Additional inventors are being named on th____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

ALUMINUM PALLETS

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 11 ☐ CD(s), Number

☒ Drawing(s) *Number of Sheets* 8 ☒ Other (specify) Return receipt postcard.

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☒ Applicant claims small entity status. See 37 CFR 1.27.

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FILING FEE AMOUNT ($) $80.00

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Respectfully submitted,

SIGNATURE

Date 02-17-2004

TYPED or PRINTED NAME Micha I S. Leonard

REGISTRATION NO. *(if appropriate)* 37,557

Docket Number: 115636-002

TELEPHONE 312-807-4270

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Mani Ayyakannu
Appl. No.: Unknown
Filed: February 17, 2004
Title: ALUMINUM PALLETS
Art Unit: Unknown
Examiner: Unknown
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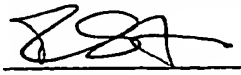

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SPECIFICATION

TITLE OF THE INVENTION

"ALUMINUM PALLETS"

CROSS REFERENCE TO RELATED APPLICATIONS

Provisional patent application number 60/511,012 filed on October 14, 2003 is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

The present invention generally pertains to pallets. More specifically, the present invention pertains to metallic pallets, particularly aluminum pallets. The present invention also pertains to methods of making metallic pallets.

Pallets are commonly used to support and transport objects or loads. Existing pallets have been constructed from wood. Wood pallets are typically constructed from various wood boards assembled together by fasteners, such as nails or staples. Wood pallets can have disadvantages. For example, wood pallets may be water or fluid absorbent, environmentally unfriendly, susceptible to damage, susceptible to fire, and rather heavy.

Pallets have also been constructed from plastic materials. Plastic material pallets also disadvantages. Plastic material pallets may not be fire retardant. Fire retardants, such as bromine, can be added to plastic material pallets. However, such additives tend to significantly increase the costs of plastic pallets and may not be desired for food carrying applications.

Pallets are generally subjected to significant abuse and pallet damage can be a concern. Pallets may be struck by fork lift tines or dropped on an edge of the pallet, for example. The impact of a fork lift tine on a pallet can cause significant damage to the pallet and compromise the pallet's functional ability and even render the pallet unusable. Similarly, pallets may be dropped on an edge and suffer damage.

Accordingly, needs exist to improve pallets for the reasons mentioned above and for other reasons.

SUMMARY OF THE INVENTION

The present invention provides improved pallets. One improved pallet according to the present invention is an extruded aluminum pallet. The extruded aluminum pallet has a plurality of hollow extruded aluminum components welded together to form a pallet. A plurality of hollow extruded aluminum blocks and a plurality hollow extruded aluminum cross members are welded together to form the aluminum pallet. The blocks and the cross members are orientated perpendicular to each other. Various internal ribs are provided inside of the hollow blocks and the hollow cross members.

The extruded aluminum pallet according to the present invention provides remarkable strength. Also, the pallet resists damage, which can be caused by impact to the pallet or dropping the pallet, for example. The pallet is light weight, yet provides sufficient strength to support heavy loads. For example, one extruded aluminum pallet according to the present invention can support a 15,000 lbs load. The aluminum pallet is fire retardant and environmentally friendly. The aluminum pallets can be recycled if desired.

One or more embodiments of the present invention are described as being constructed of extruded aluminum. However, the present invention is not necessarily limited to pallets constructed of extruded aluminum. Pallets according to the present invention can be constructed from aluminum components which are not extruded. For example, rolled aluminum or other aluminum components may be used with the present invention. Furthermore, materials other than aluminum may be used to construct pallets according to the present invention. For example, other metal materials and non-metal materials may be used in pallets of the present invention. Also, combinations of any of the materials may be suitably used to make pallets according to the present invention.

One an advantage of the present invention to provide an improved pallet.

Another advantage of the present invention to provide an improved aluminum pallet.

A further advantage of the present invention to provide a light-weight, high strength pallet.

Yet another advantage of the present invention is to provide a pallet which resists impact damage.

An advantage of the present invention is to provide an extruded aluminum pallet which has sufficient strength, stiffness, and impact resistance for pallet applications.

Another advantage is to provide an improved method of making pallets.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the figures. The features and advantages may be desired, but, are not necessarily required to practice the present invention.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a top view of an aluminum pallet according to the present invention.

Figure 2 shows a bottom view of the aluminum pallet of Fig. 1.

Figure 3 shows a corner block of the aluminum pallet of Fig. 1.

Figure 4 shows two middle blocks of the aluminum pallet of Fig. 1.

Figure 5 shows a top outer perimeter member of the aluminum pallet of Fig. 1.

Figure 6 shows a top cruciform member of the aluminum pallet of Fig. 1.

Figure 7 shows a top ladder member of the aluminum pallet of Fig. 1.

Figure 8 shows a bottom member of the aluminum pallet of Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

One example of a pallet according to the present invention is shown in Figs. 1 and 2. The pallet of Figs. 1 and 2 is an extruded aluminum pallet. Fig. 1 shows a top side of the extruded aluminum pallet and Fig. 2 shows a bottom side of the aluminum pallet. The aluminum pallet has a plurality of extruded aluminum blocks and extruded

aluminum cross members welded together. The blocks are oriented with a generally vertical axis and the cross members are orientated with a generally horizontal axis. The blocks and the cross members are positioned relative to each other such that their respective faces are generally perpendicular. Also, the ends of the cross members are welded to the faces of the blocks rather than the cross members overlapping the top or bottom sides of the blocks.

The blocks and the cross members are hollow tubes and may be made out of any suitable hollow tubular components in addition to extruded aluminum. For example, hydroformed hollow tubes may be suitable hollow tubular shapes according to the present invention.

A corner block of the aluminum pallet is shown in Fig. 3. The corner block is provided at the four corners of the aluminum pallet. The corner block is a hollow aluminum extrusion having internal ribs or walls which form a plurality of internal cells. The internal ribs provide the corner block with strength, stiffness and resistance to denting. The corner block has a rounded outer corner.

The corner block can provide for a controlled deformation of the corner block due to impact or dropping of the pallet, for example. The rounded corner of the corner block tends to deform inward into the corner internal cell when the pallet is dropped at an angle on the corner block. The controlled deformation can allow the pallet to still be used for its intended purpose even though the pallet sustained damage. Otherwise, if the corner tended to deform outwardly, the damage to the pallet may render the pallet non-useable. Outward deformation or bulging of a damaged pallet can interfere with the tines of a forklift or may interfere with stacking of pallets, for example.

Fig. 4 shows blocks used for the center block and the four side blocks or middle blocks. The center and side blocks have internal ribs forming internal cells. The internal ribs provide the center and side blocks with strength, stiffness and resistance to denting. The vertical axis orientation of the corner blocks, the side blocks, and the center block provides the blocks with remarkable strength to allow the pallet to support heavy loads.

Fig. 5 shows a cross member used for the outer perimeter of the top side of the pallet. The cross member has vertical and horizontal internal ribs forming internal cells. The vertical and horizontal ribs provide an outer portion of the cross member

with increased strength and impact resistance since that portion faces away from the pallet and may be subject to greater risk of damage. The inner portion of the cross member may not have the internal ribs to reduce costs since that portion faces inward into the pallet. Also, the outer portion of the cross member has greater material thicknesses than the inner portion of the cross member. The top, outer corner of the cross member is rounded. The structure of the cross member, particularly the internal rib and cell structure, allows the cross member to elastically deform. When the cross member is subjected to an impact, the cross member tends to elastically deform and absorb the energy of the impact. The cross member then returns to at least partially to its original shape as there may be some permanent or plastic deformation. Friction ridges may be provided on the top face (and also the bottom face, if desired) of the cross member. The friction ridges can provide a friction surface for the load supported by the pallet such that the load does not slip or slide on the pallet. The friction ridges may be aluminum protrusions from the surface of the cross member, such as about 0.3 mm ridges. Other mechanisms can be used to provide the surface with friction enhancement properties or components attached to the surface to enhance friction.

Fig. 6 shows a cross member which is a cruciform cross member on the top side of the pallet. Four cruciform cross members are connected to the center block, one on each side of the center block. The four cruciform cross members form a generally cruciform shape when connected to the center block. The cruciform cross member has internal ribs which form internal cells. The top side cruciform cross member may have friction surfaces (top surface and/or bottom surface) similar to the friction surfaces of the top side outer perimeter cross member of Fig. 5.

Fig. 7 shows a cross member which is a ladder member for the top side of the pallet. The pallet example of Fig. 1 has 3 groups of 3 ladder members for a total of 9 ladder members. The ladder members are connected to the outer perimeter cross members of Fig. 5 and to the cruciform cross members of Fig. 6.

Fig. 8 shows a cross member used for the bottom side of the pallet as shown in Fig. 2. The bottom side cross member of Fig. 8 is used for the bottom side perimeter cross members and for the bottom side cruciform cross members. The cross member has internal ribs forming internal cells. The bottom face of the bottom cross member has a plurality of exterior ribs projecting downward. The exterior ribs provide

enhanced stiffening of the bottom cross member. Also, the exterior ribs provide the bottom of the pallet with a friction surface to reduce or eliminate undesired slipping of the pallet when resting on a surface. Of course, structures other than the exterior ribs may be used or applied to the cross member to provide the bottom face of the bottom cross member with a friction enhanced surface.

The internal ribs of the pallet components provide strength, stiffness and resistance to denting. Also, the tubular structure of the pallet components provides torsional stiffness and bending stiffness.

Referring to Figs. 1 and 3-5, the top side outer perimeter cross member is connected to a corner block at one end and to a middle block at the opposite end. The top and bottom faces of the top side outer perimeter cross member are generally horizontal and generally perpendicular to the corresponding generally vertical faces of the corner block and the middle block. The cross member does not overlap or rest on the top sides of the corner and middle blocks. That structure along with the structure of the internal ribs and cells of the corner block and the middle block provides remarkable advantages. The structure provides the pallet with remarkably tremendous strength for supporting loads on the pallet. Additionally, when the cross member is struck with an impact force at its outer edge facing away from the pallet, for example by a fork lift tine, the cross member tends to elastically deform inward and then return to its original position. The cells of the corner block and the middle block along with the structure of the cross member connected to the blocks allows at least portions of the blocks to elastically twist as the cross member bends inward toward the center of the pallet. The force of the impact is absorbed and the cross members flex back outward and the blocks twist in the opposite direction to return to their original positions. The twisting cells of the blocks can be described as torque towers. In this manner, permanent damage to the pallet can be reduced or eliminated. Also, the inventive structure allows the cross member to remain "in plane" after an impact. If the impact load is sufficiently severe to cause permanent deformation of the cross member, the cross member remarkably tends to remain within its original plane, that is, the cross member does not tend to deform upwardly above the original top plane of the pallet. Prior pallets which deform out of plane have experienced difficulties with properly supporting a load on the pallet and with stacking of unloaded pallets. The

present invention can provide the advantage of reducing out of plane deformations, which allows for proper load support and stacking of unloaded pallets.

Referring to Figs. 1 and 8, at least the top outer edge corner of the bottom cross member is rounded. The rounded edge corner provides advantages. For example, the rounded edge corner easily guides fork tines to ride on top of the bottom cross members when the fork tines are being inserted in the pallet. This reduces impacts and damage by the fork tines. Similarly, the bottom edge corner of the top outer perimeter cross member of Fig. 5 is rounded. The rounded edge corner also tends to reduce impact damage from fork tines by guiding the fork tines underneath the top cross members during inserting of the fork tines into the pallet.

Referring to Figs. 1 and 2, all of the cross members (outer perimeter cross members, cruciform cross members, and ladder cross members) are welded closed in a fluid tight seal. The pallet components are hollow and it is desired to prevent water and other fluids or foreign bodies from entering and being retained within the internal portions of the components. The vertical axis orientation of the open ended blocks allows for fluids and foreign bodies to pass through the blocks without being retained within the blocks.

The cross members and the blocks may be connected together by other methods or mechanisms. For example, the joint between a cross member and a block may only be partially welded. The remaining portion of the joint may be sealed by another means. Examples of some other sealants include spray on sealants, glues and caulk type sealants. Such sealants could also be applied to the welded portion of the joint, if desired.

As described above and shown in the drawings, the blocks and cross members have various internal ribs and external walls. The material thicknesses of the ribs and walls are defined to provide the aluminum pallet with sufficient properties, such as strength, stiffness and impact resistance, suitable for the pallet's intended use. The material thicknesses of the ribs and walls is defined thin enough to reduce the costs of the pallet, yet thick enough to provide the desired properties of the pallet. Different portions (ribs and walls) of any particular block or cross member may have a different thickness than another portion (rib or wall) of the particular block or cross member. For example, the walls of the corner blocks that face outwardly from the pallet may

have a greater material thickness than the walls of the corner block that face inwardly. The other cross members may also have different portions which have different wall thicknesses.

Different aluminum alloys can be used for different components of the aluminum pallet. For example, a high strength aluminum alloy may be used for the blocks around the outer perimeter of the pallet and for the cross members around the outer perimeter of the pallet. A lower strength aluminum alloy may be used for the center block and for the cross members and ladder members positioned inside of the outer perimeter of the pallet. The high strength aluminum allow provides strength, stiffness and impact resistance to the more damage vulnerable perimeter of the pallet. The relatively lower strength allow, such as a standard strength aluminum allow, can be used for portions of the pallet which are not subject to as intense of abuse or damage. The relatively lower strength aluminum allow may be easier to manufacture into the desired components and thus, be a lower cost material.

The example of the pallet is described as having the components welded together. Any suitable welding method can be used to assemble the pallet components. For example, conventional welding, pulsed MIG welding, arc welding, and laser welding, and other welding methods can be used to make the pallet. Furthermore, other suitable material bonding methods are contemplated by the present invention which are suitable for the particular materials selected for the pallet.

It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the present invention and without diminishing its intended advantages. It is therefore intended that such changes and modifications be covered by the appended claims.

CLAIMS

The invention is claimed as follows:

1. A pallet, comprising:

a plurality of hollow blocks having generally vertical orientations;

a plurality of hollow cross members having generally horizontal orientations, the cross members connected generally perpendicularly to faces of the hollow blocks; and

a plurality of hollow ladder cross members on a top side of the pallet.

2. The pallet of claim 1, wherein at least one of the hollow blocks, the hollow cross members, and the hollow ladder cross members have internal ribs defining internal cells.

3. The pallet of claim 1, wherein the pallet has different portions which have different wall thicknesses.

4. The pallet of claim 1, wherein the pallet has different portions made of different metal alloys.

5. The pallet of claim 1, wherein the hollow blocks, the hollow cross members, and the hollow ladder cross members are extruded aluminum.

6. The pallet of claim 1, wherein the hollow blocks, the hollow cross members, and the hollow ladder cross members are constructed of metal.

7. An extruded aluminum pallet having a plurality of hollow blocks and a plurality of hollow cross members welded together.

8. The extruded aluminum pallet of claim 7, wherein at least some of the plurality of hollow blocks and at least some of the plurality of hollow cross members have internal ribs.

9. A metallic pallet having a plurality of hollow blocks and a plurality of hollow cross members bonded together.

10. The metallic pallet of claim 9, wherein at least some of the plurality of hollow blocks and at least some of the plurality of hollow cross members have internal ribs.

11. A method of making a metallic pallet, comprising the steps of:

bonding a plurality of generally horizontal hollow metallic cross members to a plurality of generally vertical hollow metallic blocks; and

bonding a plurality of generally horizontal hollow metallic ladder members to a top side of the pallet.

ABSTRACT OF THE DISCLOSURE

The present invention provides enhanced pallets. The pallets may be aluminum extruded pallets having a plurality of hollow blocks and a plurality of hollow cross members. The blocks and cross members are welded together to form a pallet. The blocks have generally vertical axes and the cross members have generally horizontal axes. The ends of the cross members are attached to the vertical faces of the blocks such that the cross members and the blocks are about perpendicular to each other. The pallets have a high load strength supporting capability and reduce damage to the pallets.

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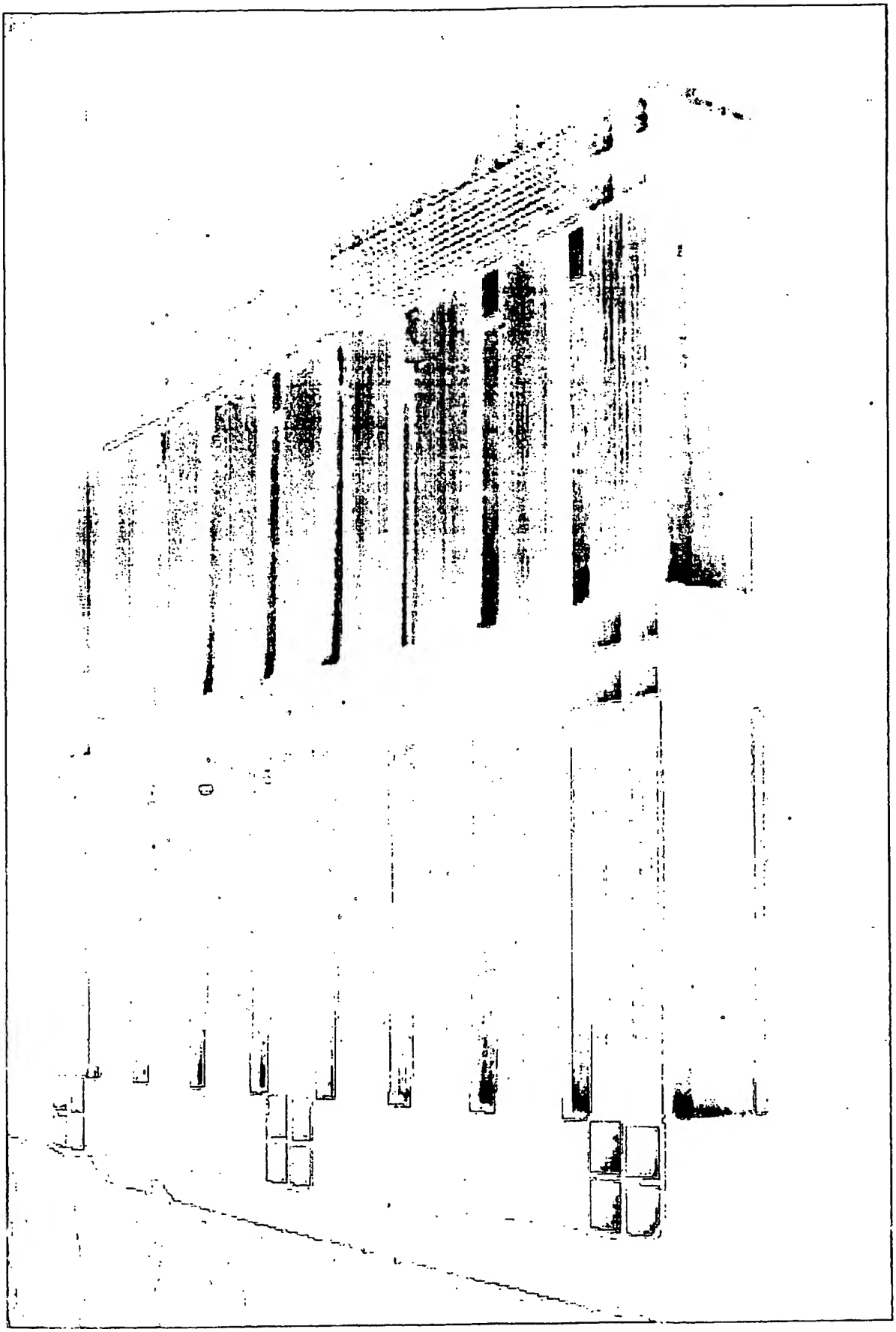
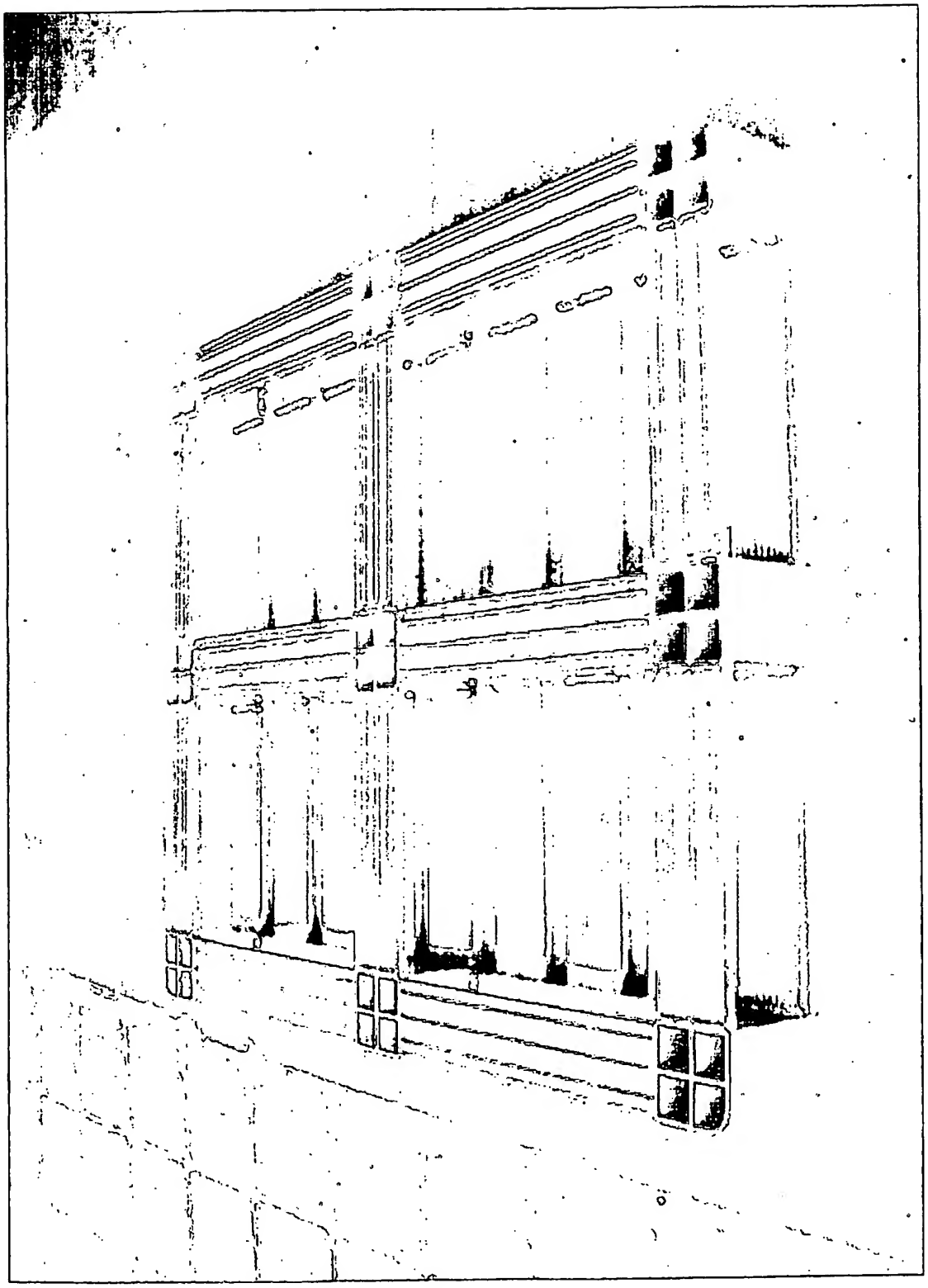


FIG. 1



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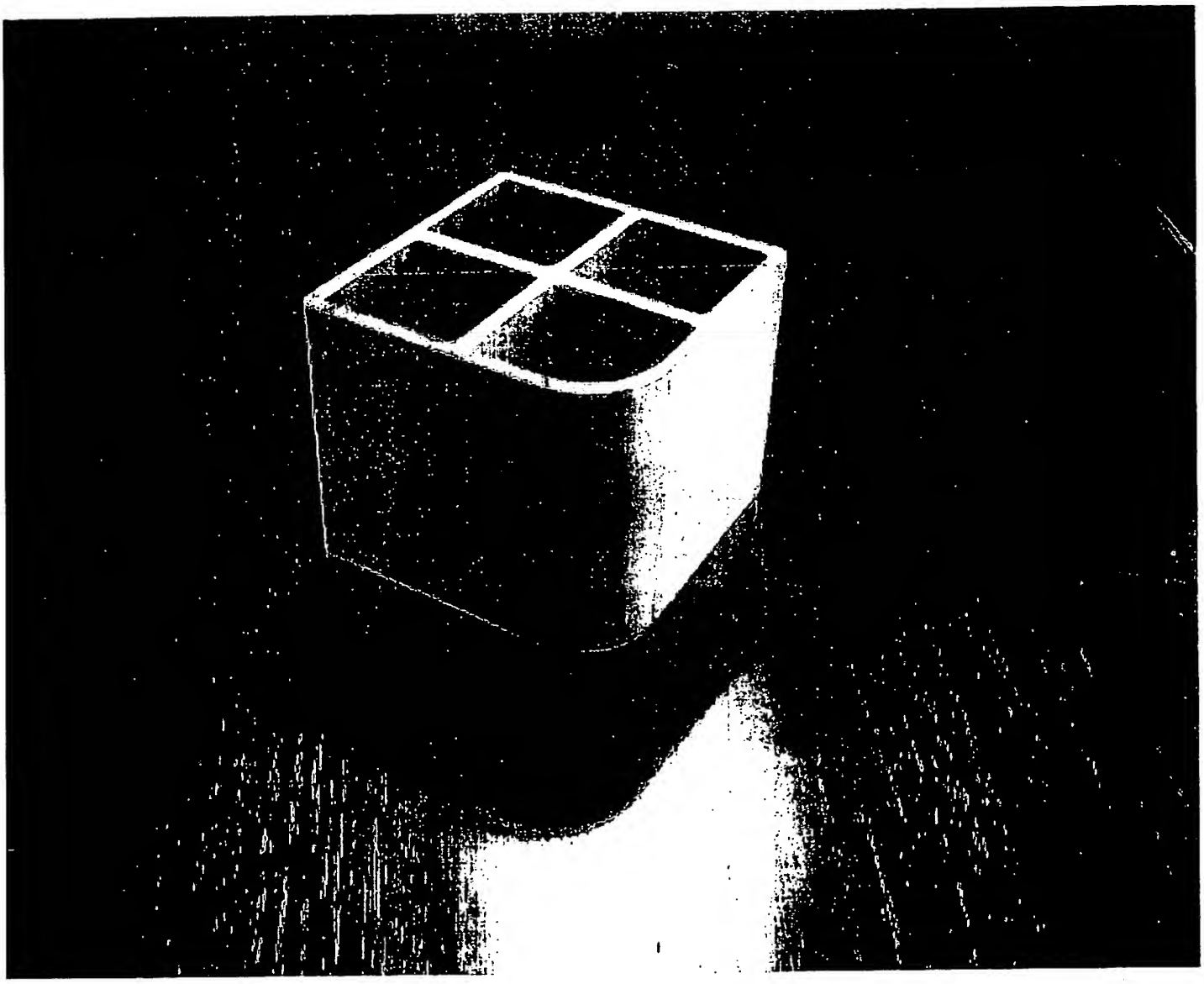

FIG. 3

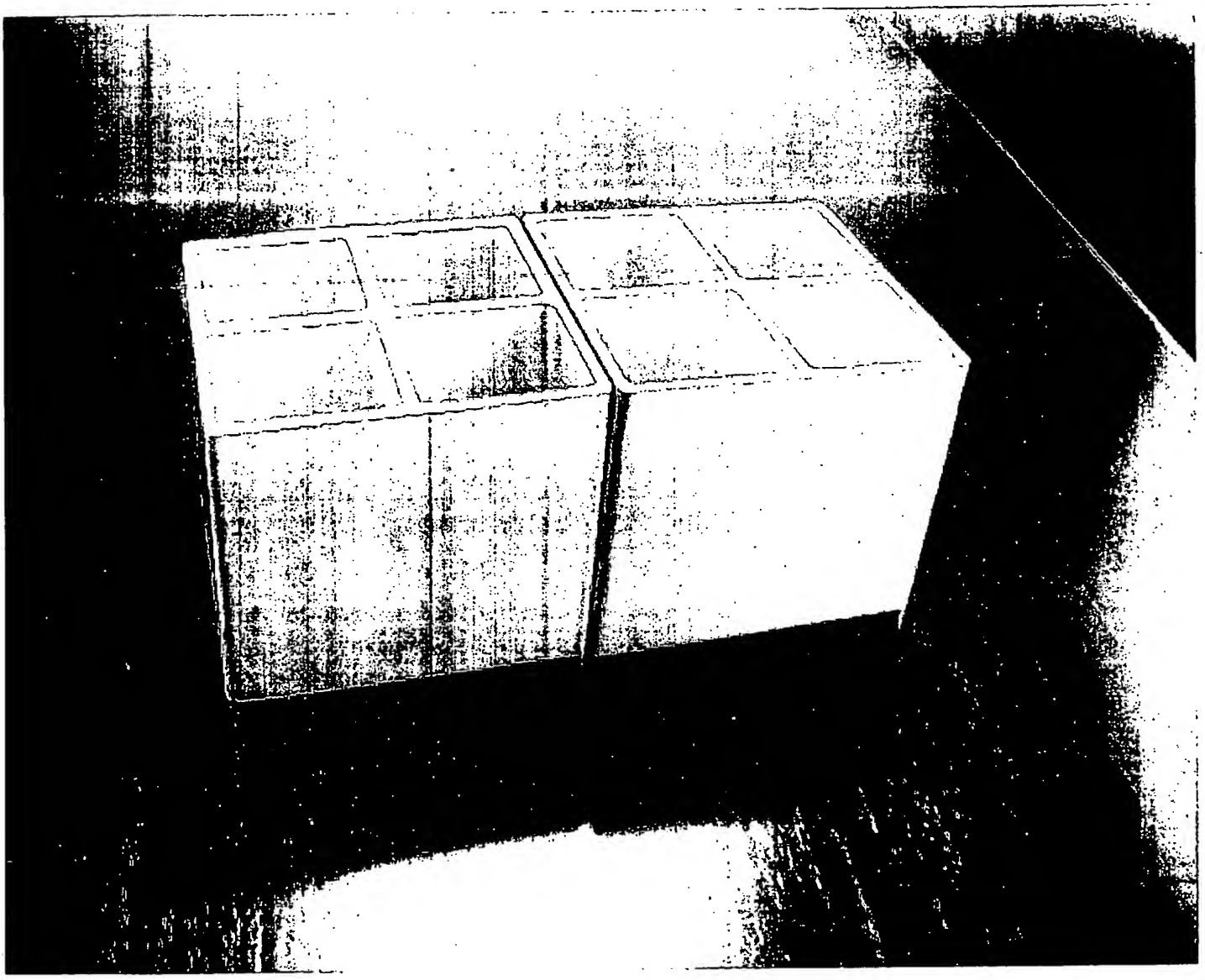

FIG. 4

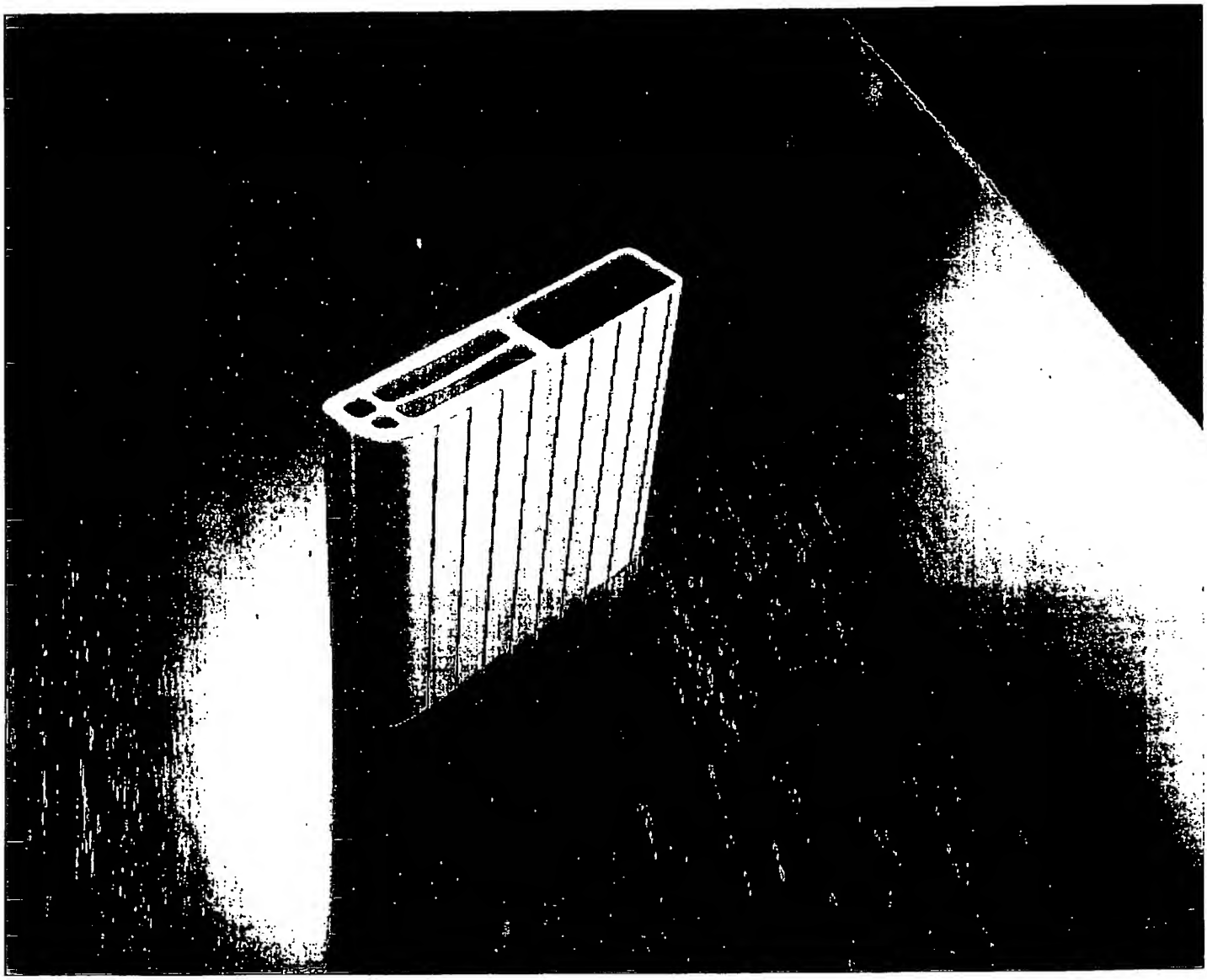

FIG. 5

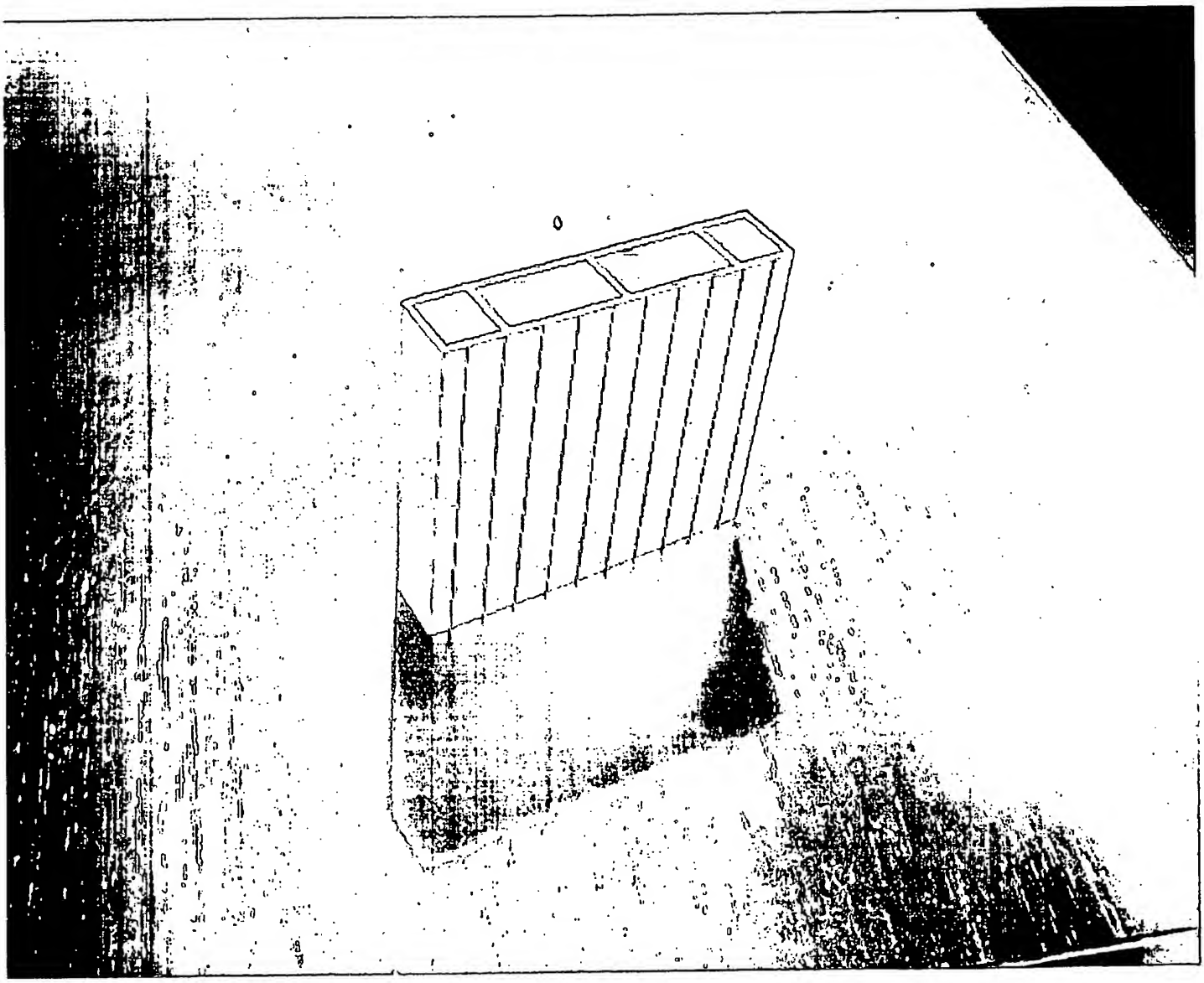

FIG. 6

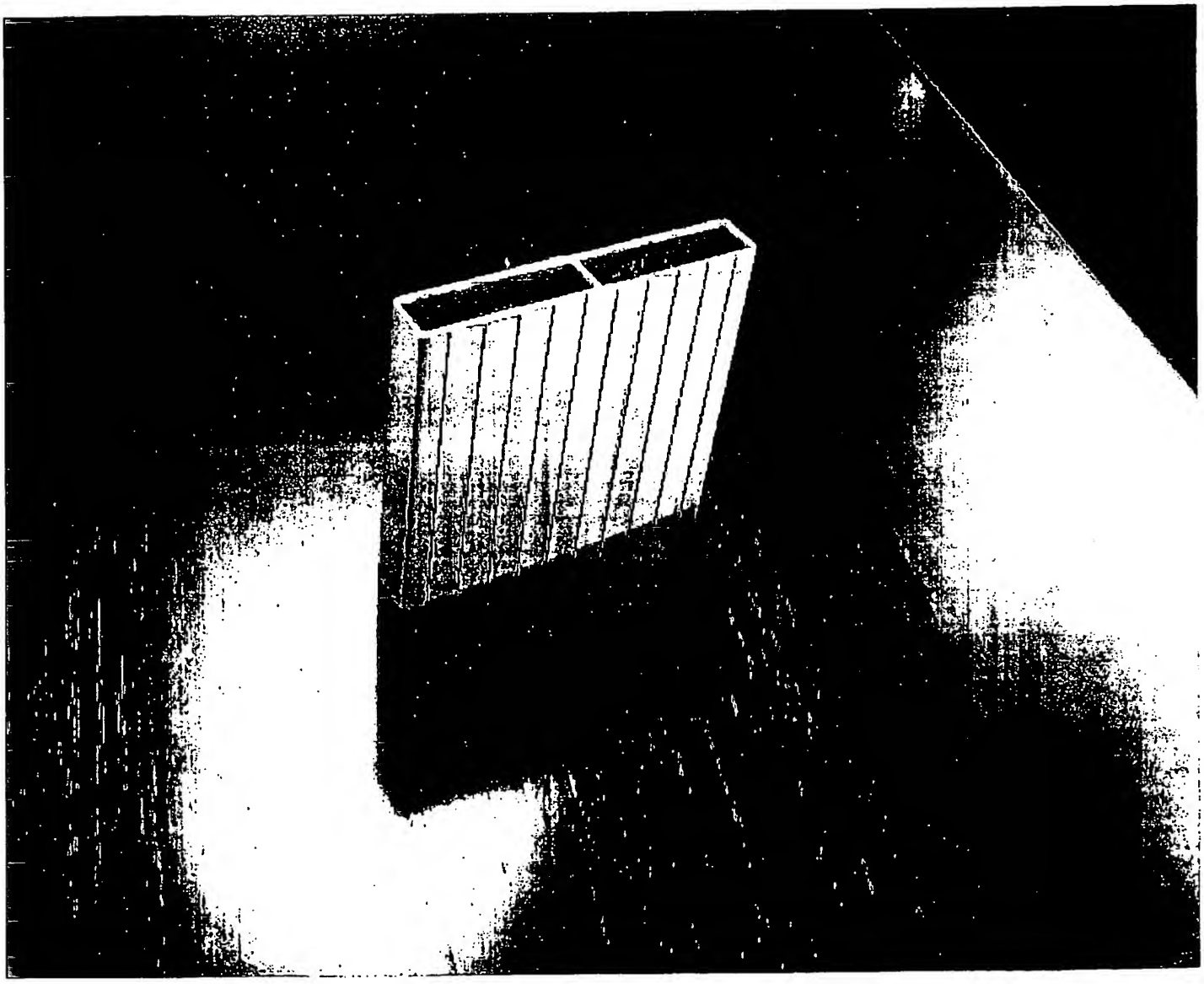

FIG. 7

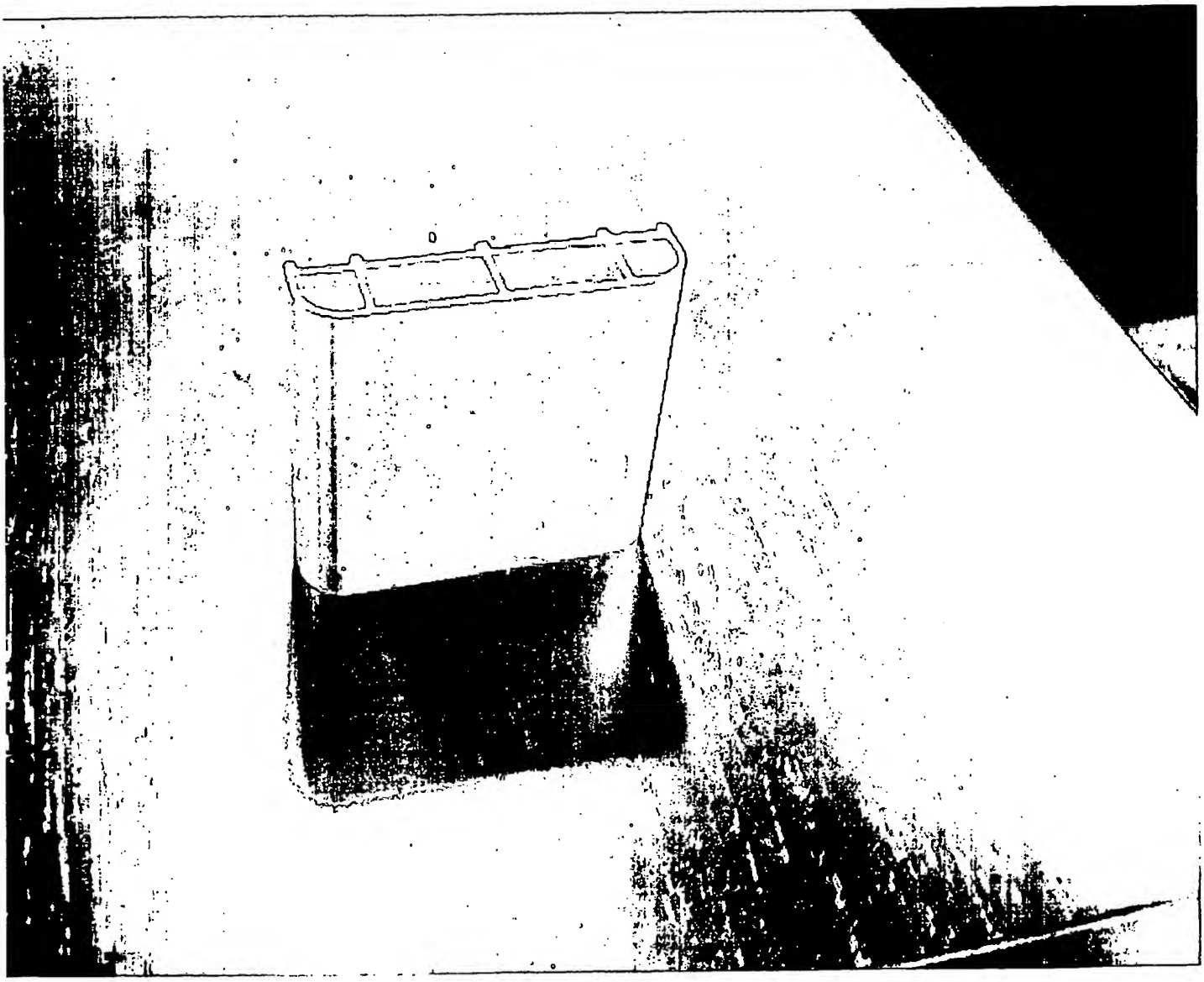

FIG. 8

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